

1 13. (New) The method of Claim 12 further comprising the step of maintaining the temperature  
2 of the molten reactant metal at a minimum of approximately 800 degrees Celsius during  
3 the reaction period.

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5 14. (New) The method of Claim 12 wherein the steps of immersing the tire portion in the  
6 molten reactant metal and containing the tire portion on the tire carrier include:

- 7 (a) lowering the tire portion into the molten reactant metal on the tire carrier; and  
8 (b) pressing the tire portion into the molten reactant metal with a tire contactor  
9 member extending across an area above the tire carrier.

10  
11 15. (New) The method of Claim 12 wherein the step of removing unreacted solids from the  
12 molten reactant metal includes:

- 13 (a) lifting the tire carrier from the molten reactant metal and allowing the molten  
14 reactant metal to drain from around the unreacted solids and tire carrier; and  
15 (b) cooling the tire carrier and unreacted solids located on the tire carrier.

16  
17 REMARKS

18 The Applicant respectfully requests reconsideration and allowance of Claims 1 through 4,  
19 6, and 7, and consideration of new Claims 8 through 15 in view of the above amendments and the  
20 arguments set forth below.

21 No notice of Draftsperson's patent Drawing Review (PTO-948) was included with the  
22 First Office Action. The Applicant therefore presumes that there is no objection to the drawings.

1 The Applicant appreciates the indication in the First Office Action that Claims 5 through  
2 7, as originally submitted, were directed to allowable subject matter.

3  
4 THE AMENDMENTS TO THE DISCLOSURE

5 The disclosure is amended above to correct an error in the abstract and to fill in the patent  
6 number for the application from which the present application is divided. The disclosure is also  
7 amended at page 9 to add a preferred temperature for the molten reactant metal. The temperature  
8 defined as a minimum of 800 degrees Celsius is taken from U.S. Patent No. 5,000,101, the  
9 content of which was incorporated in the present application as filed.

10  
11 CLAIMS 1-4, 6, AND 7 ARE ALLOWABLE OVER THE CITED ART

12 The Examiner previously indicated that Claims 5 through 7 were directed to allowable  
13 subject matter. Claim 1 is amended above to incorporate the limitation previously set out in  
14 Claim 5, and Claims 6 and 7 are amended above to depend from Claim 1 rather than Claim 5.  
15 Thus, Claims 1 through 4, 6, and 7 should be in condition for allowance.

16  
17 CLAIMS 8-15 ARE ALLOWABLE OVER THE CITED ART

18 The Examiner rejected Claims 1 through 4 under 35 U.S.C. §103(a) as being as being  
19 unpatentable over U.S. Patent No. 3,996,022 to Larsen (the "Larsen patent") in view of U.S.  
20 Patent No. 5,236,352 to Carpenter (the "Carpenter patent"). Claims 1 through 4 are replaced  
21 with new Claims 8 through 15, and the Applicant respectfully submits that these new claims are  
22 not obvious in view of the Larsen and Carpenter patents and are entitled to allowance. In

1 particular, the Applicant submits that the Larsen and Carpenter patents do not individually or as  
2 combined teach or suggest all of the elements set out in the present claims.

3 The Larsen and Carpenter Patents

4 The Larsen patent discloses using a molten salt catalyst at certain temperatures to produce  
5 hydrocarbon gasses, fuel oil, and carbonaceous residue from waste tires. It should be noted that  
6 the process disclosed in the Larsen patent employs molten salt catalysts and not molten reactant  
7 metals.

8 The Carpenter patent discloses a system using hot oil to pyrolyze waste tires and thereby  
9 recover hydrocarbon gasses and fuel oil. The hot oil is simply used to heat the tire material  
10 sufficiently to convert portions of the tire material to the desired products.

11 New Claims 8 and 12

12 Like the Larsen and Carpenter references, the present invention is directed to recovering  
13 materials from waste tires. However, the process employed in the present invention is entirely  
14 different from that shown in the cited references. In particular, rather than using a heating  
15 medium such as a hot oil or a catalyst such as a molten salt, the present invention employs a  
16 molten reactant metal to chemically react with the organic materials included in the waste tires.  
17 Element (a) of Claim 8 specifically requires "contacting a tire portion with a molten reactant metal  
18 including aluminum" while element (a) of Claim 12 requires "immersing the tire portion in a  
19 molten reactant metal including aluminum or an aluminum alloy." Because none of the references  
20 of record in the present case teach or suggest reacting waste tires with a molten reactant metal of  
21 any type, and certainly not a reactant metal containing aluminum, Claims 8 and 12 should be  
22 allowable over the cited references based on this point alone.

1 Furthermore, in addition to requiring the step of contacting or immersing the tire in a  
2 molten reactant metal, both Claims 8 and 12 require that the contact or immersion be for a  
3 reaction period comprising a period of time sufficient to allow substantially all of the organic  
4 material in the tire portion being treated to react with the molten reactant metal. The remaining  
5 unreacted material is then removed from the molten reactant material immediately after the  
6 reaction period or upon completion of the reaction period (element (c) of Claims 8 and 12). This  
7 removal of unreacted material made up of mostly steel from belting material in the tire, is critical  
8 in the present system because the reactant material actually dissolves the steel if the contact is  
9 maintained. Allowing the steel to dissolve into the molten reactant metal would eventually  
10 corrupt the molten reactant metal and make it unsuitable for treating the waste tires. In contrast,  
11 the cited references do not teach or suggest removing any unreacted material remaining from a  
12 waste tire from contact with a molten pyrolyzing material at the specified time and, because the  
13 pyrolyzing materials do not dissolve the steel, the cited references show no appreciation for the  
14 importance of promptly removing the unreacted materials.

15 For these reasons, the Applicant believes that Claims 8 and 12 are not obvious in view of  
16 the Larsen and Carpenter patents and are entitled to allowance together with their respective  
17 dependent claims.

18  
19 CONCLUSION

20 For all of the above reasons and in view of the claim amendments, the Applicant  
21 respectfully requests reconsideration and allowance of Claims 1 through 4, 6, and 7, and  
22 consideration and allowance of new Claims 8 through 15.

1 If the Examiner should feel that any issue remains as to the allowability of these claims, or  
2 that a conference might expedite allowance of the claims, he is asked to telephone the undersigned  
3 attorney.

4 Respectfully submitted,

5 SHAFFER & CULBERTSON, L.L.P.

6  
7 Date: 17 Dec 2002

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16 CERTIFICATE OF FACSIMILE

17 I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark  
18 Office, (Fax No. 703-872-9310 ) on December 17, 2002.

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**EXHIBIT "A"**  
**(10/055,394)**  
**MARKED UP SPECIFICATION PURSUANT TO 37 C.F.R. §1.121(b)(1)(iii)**  
**(Deletions bracketed and insertions underlined)**

1. Replace the paragraph beginning at page 1, line 8 of the specification with the following paragraph:

The present application is a divisional of U.S. Patent Application Serial No. 09/154,636, filed September 17, 1998, entitled "METHOD FOR RECOVERING MATERIALS FROM WASTE TIRES," now U.S. Patent No. 6,346,221 [\_\_\_\_\_.]. The Applicants claim priority from this parent application under 35 U.S.C. §120. The disclosure of the parent application is incorporated herein by this reference.

2. Replace the paragraph beginning at page 9, line 20 of the specification with the following paragraph:

Tires are comprised of approximately 56% various organic compounds, including rubber and natural and synthetic binders, 30% carbon black, 10% stainless steel, and 4% inert materials by weight. The preferred molten aluminum or aluminum alloy reactant metal, preferably held at a minimum temperature of approximately 800 degrees Celsius, strips elements from the carbon atoms in the organic compounds to form various aluminum and perhaps other metal salts. The liberated carbon sublimes to a gaseous state at the operating temperature of the molten reactant metal and some of the metal salts may also go into a gaseous

**EXHIBIT "A"**  
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**(Deletions bracketed and insertions underlined)**

phase. Other metal salts produced by the reaction may separate by gravity to the top of the reactant metal alloy below any graphite layer.

3. Replace the title at lines 1 and 2 of the abstract, page 15, with the following title:

**METHOD FOR RECOVERING MATERIALS FROM [A] WASTE TIRES**

**EXHIBIT "B"**  
**(10/055,394)**  
**MARKED UP CLAIMS PURSUANT TO 37 C.F.R. §1.121(c)(1)(ii)**

**(Deletions bracketed and insertions underlined)**

7. (Amended) The method of Claim [5] 1 further comprising the step of:
- (a) purging the gas collection area of air prior to collecting substantial amounts of process gases in the gas collection area.



**EXHIBIT "B"**  
**(10/055,394)**  
**MARKED UP CLAIMS PURSUANT TO 37 C.F.R. §1.121(c)(1)(ii)**

(Deletions bracketed and insertions underlined)

1. (Amended) A method for recovering material from waste tires, the method comprising the steps of:
  - (a) contacting substantially whole waste tires with a molten reactant metal for a reaction period;
  - (b) collecting process gases released from the molten reactant metal during the reaction period, the collecting of process gases including positioning a gas recovery hood in an operating position in which a lower edge thereof extends into the molten reactant metal around the area in which the waste tires contact the molten reactant metal, the gas recovery hood defining a gas collection area in which the process gases released from the molten reactant metal are trapped;
  - (c) containing the waste tires on a tire carrier when the waste tires are contacted by the molten reactant metal; and
  - (d) removing unreacted solids from the molten reactant metal after the reaction period, the unreacted solids being contained on the tire carrier for removal.
  
6. (Amended) The method of Claim [5] 1 further comprising the step of:
  - (a) directing process gases trapped in the gas collection area to an aqueous scrubber and removing metal salts and carbon from the process [gas] gases with the aqueous scrubber.